



OBSERVATIONS

ON

THE DISEASE

WHICH HAS LATELY BEEN SO DESTRUCTIVE TO

SHEEP,

CALLED

BANE OR COATH;

PARTICULARISING THE CAUSES, AND MINUTELY DESCRIBING
THE MODES OF EFFECTING ITS CURE;

AND

POINTING OUT THOSE MEANS WHICH OUGHT TO BE
ADOPTED TO PREVENT ITS RECURRENCE.

BY JOHN DAVEY, *BATH.*

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INTRODUCTION.

IN an age of such general inquiry as the present, it is surprising to find that a subject of so much importance to the community as the diseases of Sheep, should have received so little attention. Had the subject met with the notice it deserves, there can be little doubt that much of the loss which has so lately unfortunately occurred would have been prevented, and the distress to the proprietors of flocks, consequent upon the destruction of so much valuable property, would in all probability have been unfelt.

By the newspapers alone it has appeared, that not fewer than one hundred thousand sheep have fallen a sacrifice to the liver diseases, as they are termed, in the course of a few months, in the Western Counties; and many instances have occurred of farmers losing their entire stock. With such facts before us, it would be superfluous to insist on the utility of prosecuting this branch of inquiry; it must be obvious to all, that the investigation has imperious claims to our attention.

The object of the present treatise will be to furnish the farmer with a portion of that information, which ought to be considered an indispensable part of his knowledge, viz. on the nature of the diseases alluded to; their causes; their symptoms; and the proper modes of treatment; and what is infinitely preferable, the means of prevention. That such an acquaintance with the subject is at present possessed by the agriculturists, is more, I think, than can reasonably be presumed: and it is really astonishing that the efforts of that class of society have not been more particularly directed to it, considering the extent of injury to which their property is subjected, and the stake in which they are concerned.

But the success of such an enquiry as the present must depend upon its being pursued in a legitimate way; speculations and uninformed opinions will result in disappointment. It is, therefore, unavoidable, that anatomical and physiological allusions should occur in these pages; but it will be my business

to retain as much of the philosophy of these sciences as may be useful and necessary, and at the same time to exclude all superfluous technicalities.

In the present year, I have had (through the kindness of some agricultural friends) the opportunity of dissecting and examining several sheep that had died of the liver diseases, or, which were suffering under its last stages, and killed for the purpose of anatomical examination. It then appeared, that while most of the phenomena seemed to correspond to some general type of original disease, yet there were modifications sufficiently distinct to call for a division and classification of the several species. And although in the last stages of existence there was indicated an analogy in the characters and history of its ravages, yet there were abundant reasons to doubt of its identity in all cases, and also many correlative parts, as well from testimony as observation, which proved that the exciting and predisposing causes were greatly diversified; still, however, I have thought it unnecessary to enter into a detail of the ramifications of the disease, but have given only the genuine characters of the classes which may be easily comprehended.

All the varieties of disease have been named by the farmers "Bane," but as they had observed evident differences, they divided it into "Dry Bane," "Wet Bane," "Bane with Flukes," and "Bane without Flukes." It is apparent that these terms do not rightly divide the diseases, neither can they convey any precise notion of the nature of the maladies, I have therefore adopted such titles as are significant of the things intended to be described.

I hope the agricultural reader will admit the necessity of devoting a whole chapter to a brief outline of the structure and functions of those parts which are subject to disease; principally the digestive system, and also another chapter on the appearances exhibited on dissection of diseased animals. It is only by such a preliminary acquaintance with these subjects that he can apprehend the reasons on which our subsequent recommendations are founded; and it may also serve to guide him in his own investigations, whenever future opportunities may present themselves.

I cannot presume to have accomplished all that was necessary to be effected, far from it; but I hope the general principles and views elicited will be found reasonably correct in themselves, and that they may become the means of inducing further and more accurate inquiries.

CHAPTER II.

On the Appearances of the Body at Dissection.

WHEN we examine a sheep which has been long diseased, we find that it has been reduced literally to little more than skin and bone. While viewing them little better than skeletons of animals, we cannot fail remarking the wasted away outlines of what once were muscles. And as to many of the thin flat muscles, one would almost suppose them at first glance to be obliterated, from their pale tissue-like colour, resulting from absence of blood. Their flabby softness is also conspicuous; and it seems a wonder how the poor animals contrived to move, or respire, or keep life within them so long. In some cases where the wool has fallen off, as it sometimes does, one may see these ghosts of sheep stalking about in the most pitiable condition imaginable; they creep into some ditch or unseen place a few hours before death, and in these situations they expire.

There can be little doubt, from the length of time to which their sufferings are protracted, that they possess great tenacity of life, and that they have constitutional means sufficient to repel and ultimately carry them through severe diseases, if properly assisted by medical aid; and this, I think, is some encouragement to us to attempt remedial measures.

Nothing can be more evident, from the appearance of the muscular system, than that the process of nutrition has been long arrested, the powers of assimilation have been long destroyed, or nearly so. In consequence, the animalization of the food has not taken place, while the actions of the absorbents have continued, and gradually carried away the fleshy structures and the fat. This deplorable state of things, is however by no means peculiar to the diseases we have to treat of; we only allude to it *en passant*, and proceed to other and more important details.

On laying open the abdominal cavity, we observe it to be filled with the serous fluid, or water of the dropsy ; sometimes this fluid is yellow and turbid, sometimes slightly tinged with blood, more commonly it has a blackish-green hue, as if much mixed with the morbid bile which is usually abundant, and occasionally this serous fluid has a strong putrescent odour: is in considerable quantity, but not so as greatly to distend the cavity, or to alter the general emaciated appearance. The omentum or caul can scarcely be recognised as such, its fat being all absorbed, and its thin peritoneal texture washed in, among the interstices of the intestines.

The intestines, from their being so long immersed in the water, have that soaked appearance we should naturally expect to find, and sometimes they exhibit gangrenous appearances in parts of their course, particularly in the large intestines they are distended with depraved bile, of which I have seen more than a pint in some cases, and which secretion is often abundantly found in the last stomach. Emphysema between the coats is also frequent, and pervades the cellular membrane throughout the body. The contents of the intestines are generally masticated grass, mixed up with abundance of vitiated bile, and by no means evincing those healthy chymified appearances generally seen after their exit from the fourth stomach.

The mesentery is in much the same condition as the omentum, destitute of its fat ; and from the general absence of blood, it is only here and there that a blood vessel can be recognised. Sometimes there are adhering to it many of the encysted hydatids which we shall notice in a future part of this chapter. I have not, however, observed them where the serous fluid has been present in considerable quantity. The spleen and kidneys are nearly as pale as the muscles, and they partake of that morbid softness common to the other viscera ; the spleen also appears to be much reduced in size, and the kidneys are destitute of fat, sometimes hydatids adhere to the external coat.

It is in the liver where we find the most striking and varied appearances ; sometimes this viscus is indurated, or preternaturally hardened in its texture ; and the induration occasionally approximates to a cartilaginous appearance ; at other times it is considerably enlarged, being nearly twice its usual size. Its substance is at times found morbidly flaccid, and even gangrenous, so that upon placing it with its appendages in water, in forty-eight hours, or even less ; its substance will

macerate away, leaving the vessels entire. When this gangrenous state is exhibited, I have never been able to trace flukes, or hepatic animalcula in the biliary pores: the sheep seem to have died in the acute stages of disease, and were generally from the marshy districts. It would be almost endless to recapitulate the whole of the appearances of the liver, for there is scarcely a morbid state of this organ known which it does not assume under these diseases.

The gall-bladder and biliary ducts are generally enormously distended, and are exceedingly thin and transparent: they are crammed with worms, and the vitiated bile, even into the substance of the liver. We find the biliary ducts lined with a coating more or less perfect, of a hard black concretion, resembling in some particulars biliary calculi; it would appear that the diameter of the tubes increases in proportion to their condition, or that the passage of the bile is not greatly impeded by this alone, for there is still room for the flukes. These worms, or flukes, as they are called, in shape are very tolerable miniatures of certain species of flat fish, such as the plaice. When fully grown, they are about three-quarters of an inch in length, and half an inch wide. Their colour is a dirty brownish green, streaked or spotted with darker spots, which is probably owing to the fluid in which they live, and on which it may be presumed they feed; for on pressing them with the finger in warm water they become paler, and would probably be nearly white, if this process was repeated. When we carefully observe these marks for some time, we shall notice some curious changes in their arrangement: at first they appear in an arborescent form, like vessels branching across from the middle of the back, and apparently distended with blood, or fæcal matter, which imparts to them their colour; after a while the ramifications of these vessels disappear, especially when the animal is exhausted and near death; we then observe this fluid, whatever it may be, collect itself into globules of considerable size, forming a circle of spots around the animal, with others irregularly studded about the posterior part of the body. Many of these globules are seen to coalesce, and form larger and very prominent spots till but a few remain; and these in fine specimens are equal in size to a pin's head. If the flukes are allowed to remain in the liver for some hours after it has become cold, you may have an opportunity of observing these mutations. Placing them in cold salt and water is a convenient mode for the purpose. These

animulcula can elongate their head and neck more than one-eighth of an inch, and then pretty nearly resemble the pointed head of a leech; the mouth also, when the neck is contracted, becomes circular like that of the leech. Their motion is vermicular, sometimes trailing along their bodies flat on the surface on which they may be placed; at other times, especially when they appear energetic, they draw up the sides of their bodies into three or four large plaits or arches, and making the posterior parts the fixed point, propel themselves forward by thrusting onward the head and anterior parts, until the body is flattened again.—On opening the gall-bladder, and ductus cysticus, they crawl out in shoals, and their appearance and motion are sufficiently disgusting. The ductus cysticus is generally enlarged to an equal calibre with the much-distended gall-bladder, except at the junction of the former with the cervix of the latter, where it would seem there is a sphincter muscle, for it appears as if tied in by a ligature at this point. In both these receptacles the flukes are crowded together, and it would appear that they possess some degree of locomotion, for a slight degree of commotion is observable among them prior to opening the parts, but in the biliary they are folded round themselves like rollers, to accommodate their bulk to the dimensions of the pores, which however are always much enlarged, in the larger parts of the ducts, for an inch or two into the substance of the liver, these reptiles are found two or three rolled round each other, always filling up the vessels. In this situation they are seen side by side all through the pores until the spaces are capillary, and even then we find very small ones, which it would seem, as they increase in size, push on each other gradually until those at the ductus hepaticus, are tumbled into the cystic duct, or the gall-bladder. The bile in which they live is plentiful enough, but of an exceedingly depraved and vitiated character; it is almost black, as if from the mixture of the unsecreted blood of the vena porta. Its taste is a mawkish sweet with a slight tinge of bitter, and its odour somewhat putrescent. It has a copious sediment or grounds resembling particles of coagulated blood, or rather like broken up fragments of the flukes.

The ductus communis is not enlarged far in its course towards the duodenum, and it is only for a short distance after its junction with the other ducts, that I have ever discovered the flukes, so that it would seem they rarely extend their rambles to the

intestine; neither are they to be found in the blood-vessels of the liver, they are exclusively confined to the biliary tubes.

There did not, in any instance, appear to be structural or organic disease in the stomachs, if we except a share of the flaccidity common to all the abdominal viscera, and want of blood; weakness of the pylorus may be inferred from its permitting the unchymified food to pass onward, as well as from the regurgitation of bile, and that there existed very serious functional disease, there can be little doubt.

On opening the thorax we usually found a large quantity of the serous or dropsical fluid in both pleura, and in the pericardium; the lungs in every case appeared perfectly healthy, but hydatids were occasionally found in the mediastina. The heart partook of the same pale colour as the other muscular structures; hydatids were sometimes adhering to its pericardium, and in one instance to the heart itself, but in almost every case the adipose part of the heart was broken up. The cavities of the cellular membrane were beautifully transparent, and filled with serum or lymph, affording an admirable opportunity of studying the cellular structure, which altogether resembled isinglass, size, or perhaps more aptly the vitreous humour of the eye, but a little more opaque.

A very common occurrence in the last stages of disease, is a large swelling under the lower jaw, perhaps the result of a dropsical effusion in the region of the submaxillary glands, or hydroglossus. In fact it would be difficult to mention a structure which is capable of hydropic disease that is not affected by it. And it is somewhat remarkable that this symptom, which is confessedly almost the latest in the disease, is with many farmers nearly the first indication noticed. If we cannot point out to the agriculturist how to ascertain the state of the sheep until this occurs, I fear we shall have a more slender chance of assisting him than I hope we possess; not that this circumstance in itself alone considered is of such great consequence, but it is the result of very serious preceding disease, and which certainly demands to be recognised at an earlier period.

The blood is in very small quantity, and of a poor, aqueous, diseased character. In a sheep which was killed by dividing both the carotid arteries, and jugular veins, there did not issue more than six ounces of blood at the outside, and there was then very little left in the heart and vena cava. This blood was also exceedingly thin and sily: its colour was a pale muddy red,

resembling blood very much diluted with foul water. The proportion of crassamentum to serum was as one to six, and the colouring matter was not sufficient to give the coagulable lymph a sanguineous hue. The little that remained congealed in the auricles and ventricles was remarkably pale.

I must now briefly describe the hydatids. These are the most extraordinary animals in existence. Externally they very exactly resemble a bladder, the neck of which is adhering firmly to the coats of the different viscera, or at other times the external cyst is apparently destitute of a neck, and simply entangled by the cellular tissue. The largest I have seen exceeded one inch and a half in diameter; the colour of the cyst is nearly an opaque white: it is of a very strong material, tense and firm to the touch, and requiring considerable force to tear it from its attachments: it is about as thick as the stoutest parchment, which it very nearly resembles, and it is still more strong. On the outside, the cyst has sometimes a rough ribbed touch, but its inner coat is remarkably smooth, its cavity is distended with an aqueous fluid, and floating in this fluid is the hydatid; its mouth, however, until it dies, is attached to some part of the external cyst. I am inclined to believe that it possesses muscular fibres, very like those of the bladder; these fibres are distinctly visible, and the cyst rends in a zigzag direction like the bladder. In some now before me there are concentric bands of fibres to the neck of the internal hydatid, more strongly marked than I have observed on the intestinal tube, the fibres of which are muscular beyond dispute.

The hydatid itself is another bladder or bag, which is thin, exceedingly soft, and of a more decided white colour than the external cyst. It is also distended with a clear fluid. When placed in warm water it moves about for some time, clearly proving its vitality. I have some specimens which present considerable variations in conformation. Two are joined together by the neck, resembling an hour-glass; when alive, one of these was red, and the other white; after remaining in the salt solution, the red one soon lost its colour. Some are hardened into a callous, with the outside sac much corrugated. In a specimen of this description, there were two hydatids, having a partition harder than cartilage. These were not expanded, for either of them would have occupied a much larger space than was afforded by the substance enveloping both:

they were evidently dead when removed from the body, and the fluids were of the colour and consistence of cream, I have others again where the external and internal coats are beautifully transparent and thin, but still the outer bag is exceedingly strong, scarcely to be torn with the fingers, while the inner one rends with great facility; in short, their figure and general character seem to be exceedingly capricious.

Their origin and their nature are involved in the deepest obscurity, there is scarcely room for conjecture on this subject; all the received theories of generation leave us profoundly ignorant, and it is still necessary to conceive some undiscovered laws of reproduction before we can account for their existence. From the simplicity of their organization, we should be induced to doubt of their vitality, but this scepticism is at once set at rest by observing their contractility and motion when placed in warm water.

They are certainly living animals; Dr. Baillie, who has furnished very interesting notices of them, has observed great varieties, sometimes a number of small Hydatids from the size of a pin's head to that of a gooseberry floating about in the large hydatid, and sometimes a series of them inclosed within each other like a series of pill boxes, but generally they are found unconnected. It is a common observation among the butchers, that when the hydatids exist plentifully, the sheep (even supposing no flukes are found) are in poor condition; poor enough, no doubt, if by "plentifully" is meant such quantities as I have sometimes witnessed; still I have seen good marketable meat, and have had no scruple in dining from it, where many of these hydatids (or water bags as they are called) were found; but when hydatids, flukes and tenia are all present, the case is certainly altered, and, unfortunately for the sheep, they often go altogether, and although there should be still pleasant looking meat in the carcase, I confess I would rather hold myself excused from the banquet.

The tenia, or tape worm, is by no means peculiar to the diseases under consideration, they are often found in the intestines of sheep, otherwise perfectly sound, but much more frequently in diseased sheep. It would seem that nature leaves no mode untried of attacking the animal. Almost every class of reptile in existence, capable of having life and abode in the system, are frequently to be found in the same individual; proving demonstratively that among other particulars in their

diseases, a general tendency to the production of animacula is very apparent.

It may be just mentioned that the tenia in sheep differs from that in the human subject, inasmuch as it is not joined, resembling a series of melon seeds attached to each other. It more justly deserves the name tape worm, being of the same width throughout its course, and only marked by transverse bands, like the rings of the garden worm; its width is usually about one third of an inch, its thickness about half a line, its length various: the largest I have seen could not be less than twelve feet, they are often probably longer than this.

All the various diseased appearances here detailed are the aggregate result of several examinations; of course the phenomena are not precisely similar in every instance. The hydatid was sometimes absent, and the variety of states in the liver, as already mentioned, but most of the appearances exhibited themselves in a greater or less degree in every sheep we dissected, and the description may be considered a fair type of the state in which we always find the animals which have been long diseased, or which have survived to suffer its chronic stages.

It will now be our business, in the next chapter, to trace all these phenomena to their original causes; to proceed from the data we have obtained, by a synthetic mode of investigation up to the commencement of their diseases and their predisposing and exciting causes, and from the conclusions we may thence, derive as well as from analogical deductions and the result of observations, not immediately of an anatomical or physiological nature, yet connected with the subject, to ground on these conclusions some practical results.

CHAPTER III.

On the Nature of the Diseases, &c.

WHEN we take a review of the various phenomena detailed in the last section, and remember that they were principally obtained from examinations conducted on sheep in the very last stage of the disease. We shall see the necessity of establishing an enquiry into the nature of the relations between the various parts of so complicated a mass of morbid results.

The necessity of resorting to such a mode of investigation is the more apparent; because finding it impossible to grapple with so great a mass of particulars at once, and hopeless to think of applying curative measures to such a hydra-headed state of disease, we are impelled to trace out which of the items in the diagnosis are antecedent, and which consequent, and by these means to arrive at such a simplified view of the commencements of disease, as shall enable us to recognize their essential and distinct characters.

This mode of inquiry will be more likely to terminate in some practical benefit, inasmuch as it leads us on from the consideration of the various particulars, to the legitimate deduction of some few general truths, and when these are established, by concentrating our attention upon them, their mutual dependencies and results will be perfectly and easily manageable. To explain this: a very simple circumstance may become the cause of a much more serious occurrence, and this consequence itself not resting here, may, in the chain of events, become in its turn, the cause of a still more formidable result, and so proceed to accumulate power, ad infinitum, or until, from the nature of the subject, it has worked itself to an end. Such is precisely the case with our subject; we must obtain a knowledge of the first steps and stages of diseases, if we wish to be successful in our mode of treatment. Franklin has an aphorism which aptly illustrates this, "For want of a nail the shoe was lost; for want

of a shoe the horse was lost ; for want of a horse the rider was lost ;" all might have been easily prevented at first ; but in the progress of cause and sequence, the difficulty increases every step ; and we remark, that to devote attention solely to the cure of sheep, in the last stages of complaint is, to say the least, an unprofitable expenditure of time. The question ought not so much to be, how the flukes are to be destroyed, and then absorbed, but how their generation is to be prevented? It is not so important to ascertain how the lymphatics are to be restored to such a state of action as to take up the suffused dropsical fluid after it has been formed, as to show how its formation is to be guarded against.

Although we were to succeed in killing the flukes and removing the water, the original cause would still exist, and I feel persuaded that both would soon be formed again, and thus our efforts would be ultimately nugatory. Now I do not wish it to be understood that the case is entirely hopeless after the formation of flukes. I know to the contrary, there is ground to expect a recovery, provided they have not existed too long, nor multiplied to too great an extent ; provided also, as is often the case, that the vital energies of the animal have not too much been exhausted. Still, however, our principal aim should be to watch the first indications of disease, and to prevent or annihilate even the causes of their existence.

Those who have been in the habit of noticing the progress of disease, know that one disease sometimes changes its character, and assumes a substituted state of appearances, which secondary state is of course related to the primary disease, as an effect is related to its cause. Thus, in our own species, a man may suffer from the gout for a series of years, and at the last, when the vital energies are so far exhausted as to approximate towards death, dropsy may supervene and thus finish the history. Now the last affection was evidently a consequence of the former, and was ultimately substituted for it. Or a disease which is located in a particular viscus, may affect other structures by simple extension of its seat; thus scrophula in the glands of the neck may by a metastasis involve in its ravages the lungs, and then the patient dies by consumption. Now, from a knowledge of the various relations of diseases to each other, both by extension and substitution, we are enabled to trace back a great variety of morbid appearances to their original inducing causes, care is necessary to be taken, lest

we should confound effects with agencies, or mistake one for the other ; for such is the extensive distribution of sympathy betwixt the various organs, that it is exceedingly easy to arrive at erroneous conclusions : it is, therefore, highly important, that we should avoid every thing that is equivocal, and that we exercise considerable caution in our procedure.

To revert then to our immediate object : we cannot fail at once remarking the existence of dropsy. It is a conspicuous character in this disease, that it generally succeeds to other affections, and is not in itself original or primary. It is usually preceded by considerable loss of the vital energies ; great depletion and prostration of strength, the result of some long continued or chronic illness ; it would certainly be absurd to suppose a general hydropic tendency or predisposition in a whole flock of sheep, without some previous epidemical disease. And indeed we have other proofs of dropsy being a consequence of prior disorganization, inasmuch as we can trace the derangement of the most important functions, long before the existence of this malady : thus the softness of the intestines, the want of colour in the blood, the paleness of the heart, kidneys, spleen, &c., are all correlative phenomena of this generic species of disease (dropsy), and which enable us to account for the presence of a considerable number of the appearances, noticed in our examinations ; and we also legitimately infer a morbid inactive state of the absorbent system, inasmuch as the accumulation of the serous fluid in the cavities, is the consequence of its being deposited in quantities, more than the powers of those vessels, whose office it is to convey it away after it has fulfilled its destined purpose, and become hurtful. It is a popular belief with the sheep owners, that dropsy is preceded by hydatids, if, indeed, it is not produced by them ; hence the term water bags, by which these creatures are known. I confess I cannot explain, or clearly conceive, how dropsy should be induced by them, still the remark is worthy consideration. In my observations I have noticed that when the hydatids were found, if they were not in considerable numbers, and if they appeared to be of recent formation, the fluids in the cavities did not exceed their usual healthy proportions. This certainly is not inimical to the farmers' opinion ; and that prostration of strength, very expressively called " poor condition " is sure to follow their long continuance and accumulation.

As to what has been said about their ravages, I have had no

opportunity of witnessing any thing directly of the kind. I have seen the liver covered with the hydatids, in sheep which have been fatted and brought to the market, and in which, during their life, it would have been exceedingly difficult to recognise any other disease. They certainly never prey on the viscus, if that is meant by "their ravages;" and where they are only adhering to its external peritoneal coat, (which is the case nine times out of ten) I cannot imagine any great derangement of function; still it must be admitted, that where they have once obtained a footing, their tendency is to increase to an inconvenient extent. From the variety of appearances which the hydatids are found to assume, it is exceedingly probable that the duration of their existence is limited to a comparatively short period; and it is not impossible that, after they are deprived of vitality, more serious consequences may ensue to the sheep, than would occur during their life; nor is it without the pale of probability, that hydropic maladies may result, which, but for their consequences, would never have had an existence. The notion to which we have alluded, is certainly worthy of enquiry not only on account of its relation to our immediate subject, also because it may become illustrative of the phenomena of corresponding diseases in our own species, which are unfortunately but too little known or appreciated.

Leaving these particulars, there is no doubt of the fact, that in the cases before us, dropsy is the result of a bad habit of body, and which for the most part has been previously induced by diseased states of the secreting and digestive organs, and a vitiated performance of their functions: that the lymphatic system has suffered considerably, is apparent; since its structures are confessedly unequal to the removal of the fluids and vapours of the circumscribed cavities; thereby causing a great and diseased accumulation.

The breaking up of the fatty system, the various appearances of the viscera of the chest, with the swelling under the jaw, and the peculiar composition of the blood, are all results of the same character, and are referable to the same causes. We must therefore take up the remainder of our data yet unexamined, and endeavour to trace up the indications which may be presented to us to their source. It would indeed be interesting to allude to the several particulars, item by item, and to show the minute relations and dependencies as far as they could be exhibited; but this would swell the present treatise to a

formidable extent, and perhaps would involve the reader in a number of perplexities, which it is our principal object to avoid.

We now turn our attention to the liver, for this organ naturally claims our particular notice. Here it is that the most terrible effects of disease have been developed. This viscus seems also the first in the order of the symptoms which is considerably affected; and we also know from experience that dropsy is more frequently the result of diseased liver than of any other cause.

It will be remembered that the liver exhibited a great variety of diseased appearances, such as enlargement, induration, gangrene, concretions, &c. Now we are well assured that these appearances never occur without the existence of previous inflammatory action. *Inflammation* of the liver, is a state of disease, which it is evident *has taken place*, and we have to enquire whether this affection be primary or not; for a variety of reasons I am induced to think that in some instances it is so, and I shall therefore set down hepatitis as one of the original causes of the diseases we have to investigate. I know that this affection is sometimes, and perhaps often, the result of its sympathetic connection with the stomach and alimentary canal, and this will not be lost sight of in our description of the disease and its proper treatment; as this species of disease is of a tangible and recognizable character, and as it may be next to impossible to mark the little aberrations of the digestive organs which are sufficient to induce it in herbaceous animals, I make no scruple in stopping here, and placing this affection in the list of antecedents, or CAUSES.

There is a case in which hepatitis is certainly the result of a previous disease of well marked character, and after we have treated of inflammation of the liver generally, we shall have to revert to it as another, and a very conspicuous cause of the evils we are considering.

Inflammation of the liver may be produced by intense summer heats, by sudden transition from hot to cold weather; by chills, by shearing the sheep in an inclement season, by a poor habit of body induced by low keep, especially in the winter; by great change of food; for if the stomach has to digest food of a crude nature, or to which it has not been accustomed, it is sure to be deranged, and by sympathy the liver will partake of the affection. A farmer may turn a flock of sheep into rich meadow land in the growing season, when they have been bred on a poor dry soil or down; such a transition at once, can hardly fail to be

productive of injury. These, and a variety of other causes, may induce hepatitis.

The symptoms of this disease are pain in the region of the liver, and sometimes in the shoulder; the sheep will refuse to lie on that side, and if upon pressure with the hand at the situation of the liver, the animal exhibits considerable uneasiness, but more certainly, if such pressure produces coughing; no doubt can remain of the existence of this disease. The white of the eye sometimes (indeed generally) appears yellow, from diffusion of bile at an early stage of this complaint. Sluggishness and loss of appetite are also certain accompaniments. Now all these indications taken together can scarcely fail to awaken the careful shepherd, or the farmer, to an early notice of the injury, and the more especially when he combines with them a degree of attention to the external circumstances which have been alluded to; for instance, he cannot be ignorant of the occurrence of a sudden change from heat to cold, or from wet to dry; and sometimes these transitions are so rapid, that the poor animals are in a Dutch climate to day, and an East-Indian to-morrow. He can also tell whether his flock have been exposed to heavy rains and damp chilly ground after shearing; which would be much the same as exposing a man in a state of nudity to the same circumstances. Such occasions as these should excite to a more vigilant inspection and notice, than would at other times be necessary; but these particulars will be more fully noticed in the next section, and for the present we content ourselves with giving a brief outline of the disease.

We observe that inflammation of the liver may terminate like every other inflammation, either in suppuration, induration, or gangrene; all of which will certainly be fatal, or in morbid concretions, which, if not prevented, will also prove fatal; or it may end in resolution or restoration to the healthy state: this termination is safe, and this is the object to be attained. Let us, however, suppose that the disease is allowed to take its own course, and what will be the probable result; first, the function of the liver will be seriously injured. Bile may be produced, and perhaps in an increased quantity, but it is no longer the healthy fluid it ought to be. A diseased gland is no more likely to produce a healthy secretion, than a corrupt fountain to send forth a pure stream. The bile, therefore, is no longer competent to separate the healthy chyle from the aliment; the waste of the blood occasioned by the various nutritive actions it has to

perform, is no longer adequately supplied ; the powers of the digestive viscera, from being ill supplied with the blood on which their every action depends, are much injured, and thus the case proceeds from bad to worse. Secondly; inflammation continued, leaves the liver in so weakened a state, that it becomes unable to propel its contents onward. The bile in consequence stagnates (to use a familiar term) and even undergoes incipient putrefaction. The power that is wanting in the organ itself, is sometimes assumed by the lymphatics, and they distribute the bile every where about the system, but just where it ought to be, hence a jaundiced appearance so common in the flesh of sheep killed at this juncture. Thirdly, inflammation concretes the mucuous fluid in the tubes, and even the bile itself, thereby forming morbid *saburra sordes*; filthy depositions, and if any one wishes to notice them, he has only to examine the gall ducts in the liver of diseased sheep ; examples are here unfortunately too prevalent. And fourthly, it is extremely probable that the blood from the vena porta, passes into the biliary pores in a nearly unsecreted state after the liver has been much weakened ; this seems evident from the composition of the vitiated bile.

All the long train of sad results noticed in the after stages of the disease, will have found a cause perfectly adequate to their production, and these diseases being allowed to revel as they please, go on until they have broken up the system, and left the general wreck we described in the last chapter, and even the formation of flukes is accounted for, by a reference to the third result of continued inflammatory action. The *sordes* which are formed in the ducts, are the proper nidus, if they are not the actual material which, by some undiscovered process of generation, becomes living animalcula. I am inclined to the latter opinion, however much it may appear to militate against the popular theories of generation ; which theories are confessedly too circumscribed, as they leave us without a notion of the modes of production in the polypi, the hydatid, the spermatic animalcule, or the more recently discovered monad ; but (to avoid every thing like controversy) whether the flukes are produced "*sui generis*" or not, it is beyond dispute, that but for the existence of disease, and the consequent accumulation of *sordes*, their proper nidus, they certainly would not have a being.

Why should we any longer trammel ourselves by theoretical notions of production, or demand assent to opinions from those

who cannot believe what appears to militate against the testimony of experience? I confess that I am not much instructed by reading, in one author, that the eggs of the fluke are probably deposited in the flowers of the buttercup; nor in another, that the ova of the hydatid is conveyed into the system in some unknown way. I am not sure that these laws of generation, as they are called, are exclusive laws of Nature's own making; for if we fall in with the generally received doctrines of the formation of these animalcula, what are we required to believe? why, first, that ova and larva of these creatures, which nobody has ever seen, do certainly exist on the land or in the water; 2dly, that these eggs are swallowed by the animals with their food or drink; 3dly, that when they have been swallowed, they are taken up by the lacteals, conveyed into the blood, where they ramble about for an indefinite period, till they find their way to some round-about spot, (where by the way it is next to a miracle if they ever arrive); and 4thly, that having got to this situation, they forthwith become plain flukes, or hydatids, as the case may be, and which, but for the appropriate seats, they never would have become.

I really would rather believe it possible that a few of these animalcula may continue in existence, and probably propagate a generation or two after they have been emancipated from the animal, by which they were originally produced; than that some undiscovered genus should remain, perhaps for ages, in "*statu quo*," and when a poor sheep should unfortunately be attacked with epidemical maladies, burst at once into all the beauty of independent existence. Let it not, however, be for a moment supposed, that I deny the truth of the dogmas of those who feel it necessary to establish all the received notions of generation; so far as their opinions are proved by fact, I hold them in reverence, but I do think that beside the instances I have alluded to, there are many cases in which nature does not think it proper to controul her modes of reproduction according to our square and compasses.

The plain English of this may be easily and briefly expressed. Take the tape worm as an example: is the tape worm an animal hatched in the intestinal tube from an ovum derived from without? Or is it there generated, without regard to any previous existence? The ovarist will probably assent to the first opinion, and most likely will say, I can as soon imagine a sheep being produced independently of parental agency, as a hydatid or

a tape worm. To which I reply, I can as soon imagine no such thing—what, because the simplest forms of organization, themselves produced by the existence of comparatively perfect animals are generated! therefore perfect animals are originated by the agency of mere inorganic matter. Again, no consequences follow the admission of the doctrine we have noticed, it ends in itself, and if it were established, would only prove that the grade of animal existence, just above that of the vegetable or inorganic kingdom, does not require that parade of reproduction which is congenial to our enlarged and just conceptions of the modes influencing the higher animals.

I am inclined to doubt the generally received opinion of the formation of these reptiles, because I have observed several circumstances which appear decidedly to differ from it; to mention one as an example. Three flocks were pastured on a high dry down, and without any alteration of the herbage by culture; the inclosures were adjoining each, and only parted off by Welsh hurdles. The flocks on either side were both baned. The central flock had not a single sheep baned. Now, I ask, is it possible to assign any tolerable reason why the middle flock was not diseased as well as the others, if we are determined to adhere rigidly to the supposition that the ova or larva were swallowed with the food or drink: again, lambs at birth have been found with flukes in their liver. Really I think that the speculations about the generation of intestinal and visceral animalcula are what the farmer will gain by losing. Let him attend to the state and health of his sheep in proper time, to which we shall in the next chapter allude, and he may defy all the ova and larva in the world.

And here we observe that these worms are not the cause of disease, how much soever they may contribute to its subsequent aggravation, but they are the consequence; and it is plain (as has been before hinted) that our object ought not to be so much to know how they are to be destroyed, (which is the eternal question with the farmers) but how their existence is to be prevented. And as we have seen that a diseased state of the liver, and its secretions are the causes of their production, it is necessary to ascertain this affection as early as possible, or even in some instances to anticipate it, so that our remedial measures may be the more certain to effect permanent good.

The other species of disease to which we alluded, and to

which hepatitis is sometimes only an accompaniment, or indeed a consequent, is gall sickness, which term we here use in an extensive sense, by meaning it to comprehend the varieties of fevers, of the remitting kind. *Febris remittens* is a type of a large class of affections, in their minutiae, scarcely appearing in two subjects alike, but corresponding in all their general and more important characters. Hepatitis will be much the same in all cases, and at whatever times it may appear, but gall sickness may vary with situation, or assume features of character in one year, which it may not have exhibited before in any other year. There are a variety of considerations with regard to the phenomena presented at dissection as well as from the observation of extrinsical occurrences, and also from analogy, which lead us to conclude that this malady is not only one of the causes of the destruction of the sheep, but that it is, taking the country generally, the most extensive one by far, and in our application of the nature, symptoms, and causes of this disease, this opinion will be sufficiently obvious.

It is now ascertained that the whole range of diseases to which we have applied the generic term of gall sickness, are produced by marsh miasmata. The malady is epidemical, attacking all within the sphere of its action, who may be predisposed to it. Among the circumstances which give this predisposition may be mentioned, a weakened or imperfect state of the digestive organs, from poor keep, or from eating quick grass, as it is termed, the forced vegetation which occurs after long continued rains or inundations, or it may occur from obstructed perspiration, the result of colds and chills; in short, from almost all the circumstances noticed under the head of hepatitis; yet we have causes for the production of gall-sickness after the predisposition exists, which it is not necessary to include in the other disease considered simply as such, since, if they produce hepatitis, it is only as a subsequent affection—such is the miasma, and we observe also that in its character it varies. Hepatitis is by no means so epidemical, indeed, strictly speaking, it is not so at all, although many sheep may be affected with it at the same time, because they were all exposed to the same causes: gall sickness will affect a whole flock, and perhaps most of the flocks in a district; hepatitis is much more limited in its extension, though it is often too prevalent.

As we have said, miasma is the ascertained cause of affecting

the sheep, which, from other circumstances, have become predisposed to it, it may be useful to explain what we mean by the term miasma.

When the stagnant waters of marshes, or the rains which have remained long on stiff clayey soils, are partially or entirely dried up by the recurrence of hot weather, the decayed vegetable matters with which they are loaded, are disposed to run into a decomposition, probably of the putrefactive kind, and gasses are evolved. We are acquainted with two kinds, carbonic acid and hydrogen, both of which are fatal to animal life, if not largely diluted with pure air; and even then they are detrimental to health; beside these principals, there are peculiar noxious effluvia, the precise chemical nature of which has not been ascertained. It seems to be a deleterious humid gas or vapour, held in solution by the atmosphere, and it has received the name miasma, from its quality of affecting animals with a variety of diseases; the evolution of these effluvia is increased, if the heat of sun should be violent after drying up the waters. This heat being exerted on the muddy deposits which had subsided, and which are crowded with putrescent vegetable matters, hastens its decomposition, and the exhalations are imbibed in the process of respiration.

The effects of breathing a vitiated atmosphere are very soon detected in the constitution, and soon followed by declension of health. It would seem that important fluid the blood cannot undergo a proper arterialization, since the air inspired into the lungs has not only lost a part of its vital principle, but has acquired an accession of pernicious matters. It is, however, very remarkable that the lungs do not exhibit any diseased appearances under these circumstances. The stomach, very soon shows that it is affected, and its disorganization is rapidly conveyed to the liver, through the medium of the sympathy existing betwixt these organs. There is a deficiency of vital energy or want of stimulus in the secreting organs; and of course the most inert viscera more conspicuously suffer the torpid inaction which ensues; hence it is by no means wonderful that the liver should suffer more than the other organs, in this and the other diseases we have mentioned; for we know the sluggish action of the blood it receives from the vena porta and which is calculated to circulate twenty-five times slower in it, than in any other vessels of the body of equal diameter.

Although our knowledge of the chemical properties of

miasma is confessedly imperfect, and although it does not appear to affect the lungs and respiratory system, which we should expect, and does immediately affect the stomach, liver, and digestive organs, which perhaps we should not expect; yet its baneful effects have been so fully and fairly substantiated, that we have no room to question its injurious operation on the animal economy. We must in this case, as in many others, be content to remain in ignorance of its precise mode of operation, and resort to actual experience as the only source of our knowledge on this subject.

The fatal effects of miasma are largely experienced after the flooding of the Nile, by the inhabitants of Egypt, when warm weather succeeds. It is this which renders the marshes of America, the Island of Pulo Penang, in the East-Indies, and Sierra Leone in Africa, so dreadfully mortal to our own species: It was the miasma which destroyed our army in the Netherlands, after the capture of Walcheren in 1809, and which so harassed our troops in the campaigns from 1743 to 1747; and in our own country, it is these noxious effluvia which are the prolific source of agues, remittents, and other fevers, in such situations as the fens of Ely and Cambridge, and Lincolnshire, in short in all the marshy districts. I need only appeal to the experience of every observing agriculturist, to decide whether the existence of the same causes do not develope themselves, in affections of the sheep, even to a more extensive degree, than they have ever been observed among our own species: nor will this appear wonderful, when we consider how much more the lower animals, and particularly the sheep, are exposed to its baneful influence than man is. Although the economy of the human race, and that of herbaceous animals is remarkably different, yet in all the circumstances we are now considering, there is not only an analogy, but a positive similarity. Do we require pure atmospheric air, for the due ends of respiration? so do they. Are we destroyed by inhaling noxious gasses? so are they. Is it necessary with us that our blood should be oxydized so often? so it is with them. And do we find that men are subjected to peculiar diseases in marshy unhealthy situations? So we find with the sheep, and other animals, and not only so, but even the same organs are specifically affected. It is well known, that in consequence of the very heavy rains of last summer, not only the sheep, but the cows were diseased, and precisely in the same manner, and what was considered a remarkable thing

actually took place, cows were baned, and numbers died of the disease. There are many reasons why the higher animals should not suffer to such a proportionate extent as the sheep; they are more valuable, more care is therefore taken with them; this we shall notice in our subsequent remarks. A farmer knows full well that decent keep must be provided for a cow, or she will give an indifferent supply of milk; but too often the sheep comes in, not even second best in these matters. And moreover I think we may fairly presume the cow to be somewhat about the most hardy constitutioned animal in existence, not very particular to climate; bearing the polar regions and the torrid zone with equal indifference, vigorous and at home in either, and which is a vast deal more than the natural history of the sheep would warrant us in asserting, and more than experience would induce us to conclude, although we readily allow, that even the sheep possesses considerable hardihood and inherent constitutional powers.

With regard to the miasma, we further observe, that it is impossible to determine the distance to which its baneful influence may be conveyed. A small pond, or flooded ground, may probably extend its unhealthy influence to a limited sphere, perhaps not more than one hundred yards from its circumference, but large marshes send their noxious exhalations for miles, indeed for some distance out to sea, as was fatally experienced by our fleet off the Netherlands, even when riding at anchor a quarter of a mile from the shore. When a large tract of stiff adhesive land has been for a long time drenched and saturated with rains, which cover the surface of the ground, it differs but little from a marsh. We need not be very particular in ascertaining the distance to which the miasma may be conveyed, for the herbaceous animals are particularly exposed to its influence. The sheep especially, respiring as they do close to the ground, and swallowing the gasses, as soon as they are generated.

From these arise the proximate causes of miasmata; first, any stagnant collection of waters, such as marshes, ponds, ditches, flooded lands, &c. Secondly, vegetable, or animal matters, in short, every species of matter which is, or has been, organized, and which, in consequence of the abstraction of its vital principle, is disposed to run into decomposition. Thirdly, after these circumstances, the occurrence of warm weather in the summer or autumn. These are the particulars necessary to

produce the putrefactive fermentation, and although we are still ignorant of the precise nature of the gaseous products, we are very fully informed by experience as to their violent and fatal qualities to the animal economy.

In whatever way the miasma may be received, there is positive proof that the stomach and the process of digestion, are soon deranged, attended with a rigidity of the skin, an increased and depraved secretion of bile, great listlessness, and drowsiness, stupor, yellowness of the eyes, loss of appetite, general feverishness, and sometimes a jaundiced appearance, which I have often observed in carcases exposed for sale. All these symptoms are aggravated, from inattention in the first instance, from careless management as to food, situation, &c., as well as from neglecting remedial measures: the sheep thus exposed to a succession of the same causes, the disease is ultimately rendered unmanageable from its complicated state.

The modes of ascertaining the existence of these affections, are as in hepatitis—first, by a watchful attention to the state of the sheep themselves, having a tact at observing the symptoms mentioned, which requires but comparatively little thought to have them at the fingers' end. And then, secondly, an observation of the indications which are of an external character—the farm, the food, the weather, &c. By these means the farmer will scarcely fail to recognise the mischief in sufficient time, to promise success in the measures we propose to adopt.

Having gone through the data afforded by anatomical investigation, and having seen occasion to reject in the consideration, many of the appearances as consequent, and to confine our attention to two species of diseases as primary, viz. hepatitis, and remitting fever, or gall sickness, we cannot conclude this chapter without remarking, that as in both cases the liver is always principally affected, so the results in both instances will be much the same, even to the generation of the flukes; and the hydropic tendency.

We are convinced that hepatitis often occurs without gall sickness preceding it, for often the characters are decidedly obvious; and also we cannot in many cases conclude, that the diseased sheep have been within the reach of the pestiferous miasma. These two divisions of disease will include all the states to which the sheep is subjected in these liver affections or bane, and happily the mode of treatment in both cases is not

very dissimilar. We have reason also to conclude, that the inartificial constitution of the lower animals is exceedingly favourable to the exhibition of medicines, so that we can calculate upon their probable effects. And we have a right to infer that the inherent natural powers will do much more for the restoration of the lower animals, than under the same circumstances they effect for the compound being, man.

CHAPTER IV.

On the Means of Prevention and Cure.

WHEN we have satisfied ourselves as to the nature of the causes which produce any given effect, the occurrence of which we wish to prevent; our attention should primarily be directed to the question, What power do we possess of controlling the cause itself, so as to guard against its existence? To a considerable extent we shall find that we have such power in relation to the immediate subject of our enquiry. And when circumstances of an uncontrollable kind are presented to us, a second question will be, How are we to manage matters, so that the naturally probable causes may be so far altered, or averted, as to leave no cause of dread for the result? The first enquiry will lead us to a knowledge of preventive measures; the second, to the application of curative means.

A man (we will suppose) ventures to ford a deep river, on a crazy plank, of the strength of which he is entirely ignorant; at the middle of the stream he is precipitated into it; one of the by-standers hastily seeks for a boat to reach him; another plunges in at the risk of his own life; a third ventures on the fragments of the broken plank, by their united efforts they extricate him, but his animation is suspended; others then assist in the process of resuscitation, and he is at length revived. It must be admitted, they have all done well: but he would have done better who would have repaired the bridge, or even have warned the man of his danger.

So it is with relation to the question at issue, to show how a diseased sheep is to be treated with a view to a restoration to health is some good; to show how disease is to be avoided is better. We shall, therefore, devote our attention, first, to preventive measures; and it is apparent that we must consider that much is to be attended to in the farm, as well as in

the sheep. And here let it not be said, that we are laying stress upon trifles in what we are to advance ; for it must be remembered, that trifles make up the sum of even human happiness or misery: and little incidents or particulars are too apt to be unnoticed, simply because they are such, while they are too forgetful that these little circumstances produce very extensive and serious results. There are also some particulars to which our attention will be directed, which neither in themselves, nor in their results, are unimportant.

That we may follow up our views in a consecutive train we propose considering preventive measures under three general heads. First, as to Food. Second, as to local Situation. Third, as to changes in atmospheric Temperature and Weather.

First, with regard to aliment. Experience has shown us, in innumerable instances, that sudden transitions from one kind of food to another in animals, and even in the being man, are productive of injurious effects. An Englishman, for example, could not with ease digest the raw flesh and fish oil of the Esquimaux or Greenlander; and the inhabitants of civilized countries would find it utterly unbearable, if their modes of living were suddenly changed to the precarious and sometimes disgusting supplies of the hunting tribes of America. Even if these effects have been solely produced by habits, still if these habits have been long continued, they will be found to have attained such a strong hold, that to influence or alter them is next to hopeless, and if suddenly and violently persisted in, usually prove destructive.

There are great differences in the varieties of food which the herbaceous animals are obliged to eat, and the sheep appears in a peculiarly unfortunate situation among the rest. If a horse be placed in a field, he is called an unfair feeder, that is to say, he picks out just what suits him, and rejects the rest. The horned cattle will take the herbage more indiscriminately, but they reject various species of grasses, and they do not eat very close to the ground, contenting themselves with the most nutritious parts; the well-developed blade, which contains most albumen, and least fibre. And this is not so much because they cannot crop the grass so close, (as most farmers suppose) for they can crop it close enough when compelled to do so, but it is because they act precisely upon the same principle as a man would do, supposing him to have a dish of pease and a dish of their shells set before him; it is easy to say which he would

select; perhaps if no other food were within reach, he would contrive to eat the shells rather than starve. But as to the sheep, any thing will do for it. The stalks which the more privileged cattle, or the quick grass or improper herbage which they have rejected, or the poor remnants of vegetation in stubble lands, they can (that is, they must) eat close to the ground.

But to whatever shifts they may be left in the mild growing seasons, it is surely improper to keep them poor in the winter, the season when they are with lambs, or have to support them. A judicious farmer will take special care that their situation shall then be tolerable, by affording them supplies of good hay, and this not once now and then, a feast and a fast alternating with each other, but whenever it is wanted. Of all times in the year winter is the most inappropriate for short allowance, and poor keeping is nearly certain to induce that weak habit of body which gives a station for every wretched disease to nestle in, but the farmer's own experience will be by far the best criterion for the regulation of these matters; and we are by no means advocates for too rich a pasturage, or the repletive system, however much we may deprecate its opposite character.

Again, a very conspicuous evil in the matter is the quality of the food. The grasses they are compelled to subsist on are sometimes of an acid and aqueous nature. This is conspicuously the case over clayey soils, and especially on the range of the lias, and lias clay formations. It is also the case when a forced vegetation has been formed, by abundant rains and subsequent fair weather, especially in the autumn. This product is in some degree unnatural, and requires time to ripen a little before it becomes wholesome and nutritious food. Now the consequence of permitting sheep to eat these sharp and watery grasses, have been admirably explained by Dr. Wilkinson, in that the soda in the stomach, which is absolutely necessary to abstract the albumen from the herbage, is neutralised by the acid, and consequently the albumen is but imperfectly if at all separated from the food. It is obvious that the conclusion to which we should first arrive from this consideration is, where a farm is sufficiently extensive to admit of a removal, the sheep should be removed, and thereby be prevented from eating food, the qualities of which render it improper for their economy.

The soils will be very considerably improved by a dressing of lime, but a still more certain and effectual mode as it regards our subject may be added to this; it is to allow the sheep

plenty of salt to eat. We consider this simple article of very great value and efficacy, and it will form an important feature in the matters we shall prescribe. The action of the salt given to the sheep will be to stimulate the digestive organs, and perhaps restore the balance of chemical actions in the stomach, as far as this organ is capable of controul by chemical laws; and it will be materially assisted if it contains a more alkaline ingredient with it, such as common washing soda, which is easily attainable, and which may be mixed in the proportion of one ounce or more to the pound of salt. If, however, the sheep reject the soda, leave it out, and confine them to the salt; many sheep dislike the salt at first, but they may soon be habituated to it, and made partial to its taste.

With regard to transitions from rich to poor feed, or *vice versa*, it should be managed gradually and cautiously, and then these changes, so far from being injurious, will be highly salutary and improving. We will suppose a farmer purchases a stock of sheep; he ought to be acquainted with the kind of soil and herbage to which they have been accustomed. We will imagine that the sheep have been bred and fed on the dry and almost sterile downs in the chalk districts; and that he then takes them to his farm in the low rich meadows of Somerset, or even down to the marshes in the south west of the county. What can be expected from so violent a transition, but derangement of the digestive functions; or at least a predisposition to disease? The careful farmer will be particularly cautious under these circumstances. He will select for them the dryest parts of his farm; he will fold them with more than ordinary care in airy situations. They may be allowed to range the dry lanes and roads in the vicinity, provided they do not contain improper herbage, which is not often the case; or they may be confined in the barton, for some hours of the day, it will be always advisable to make them take plenty of exercise. In short a variety of expedients may be resorted to, to prevent their over-feeding on a richer aliment than that to which they have been accustomed, until they are become habituated to it: a few weeks' discipline in this way will be productive of considerable benefit.

It has been supposed by the farmers, that there are certain species of plants or grasses which are actually poisonous, and that the sheep, by eating them, are made ill; but after inquiry into the alleged instances of this occurrence, I am inclined to

doubt the fact altogether. In no case could I obtain satisfactory proof of such a circumstance, and I cannot help thinking it would be contrary to the wise economy of nature, which has taught the sheep as well as other animals, to reject those species of plants which would poison them. And besides, I am utterly at a loss to account for the mode of action in those pernicious plants as compared with the results. And also I cannot see why it should not invariably bane them at all seasons, wet or dry, hot or cold, which is contrary to experience. Now then we have noticed bad supply of the food, bad qualities of it, and great transitions from one kind to another; all these circumstances are in the power of the farmer, and he can adopt such measures as his own judgment will suggest, to avoid the ill effects consequent on them. If he should be hindered from arranging these things properly, from motives of supposed economy, he will find such economy altogether a delusion, and for the sake of a few shillings' worth of grass, will run the risk of losing his flock; some fatal instances of this kind I have seen, and have heard of more.

Our second particular is, as to the localities of a farm. We have already adverted to the fact, that some farms are situated on stiff, clayey, or adhesive soils; and we should at once say that such farms are by no means fit for the rearing of sheep, they cannot at least compare with the downs. Still, however, much may be done to ameliorate this state of things, and which ought to be effected, not only for the purpose under consideration, but for the general advantage and benefit of the farm. These objects are fully treated of in works which have agricultural improvements, for their specific object, and to such the farmer's attention is especially directed; but there are particulars, with regard to the peculiarities of a farm, which we cannot pass over unnoticed.

We sometimes find stagnant pools, the result of accumulated rain, drainings, or land springs; these receptacles, however useful they may sometimes be, are often prolific sources of the evils we have alluded to in our account of miasma. Let any one inspect these waters in the summer months, and he will observe myriads of animalcula, they really teem with animal life; and to a still greater extent do they abound with the varieties of vegetable existence; and all these matters die, and undergo a process of decomposition. This cannot be effected without the extrication of numerous gaseous products, as may

be thus evidenced. If the bottom of the mud be agitated with a stick, bubbles of carburetted hydrogen gas are seen to arise in quantities, increasing in proportion to the heat of the weather. If a glass receiver be inverted under water, and then drawn up till only the brim is left under water, the capacity of the vessel will be filled with water; then by agitating the deposits at the bottom immediately under the glass, the gas will arise into the receiver, displacing the water, until it is filled with the inflammable air. This quantity of gas may then be ignited, and it will be found to burn in the same manner as the carburetted hydrogen with which our cities are illuminated. But as we have before observed if a succession of hot weather should dry up the supernatant waters, then those vegetable and animal matters run with great rapidity into decomposition, and the products not being impeded in their escape, are sent forth in amazing quantities. It is then that a new, and at present inappreciable product, the miasma, is abundantly evolved, and that its direful effects upon animal life are so fully evidenced.

Now so long as these parts continue covered with water, they are safe, and if they were drained in the winter, no ill effects would arise, because one of the particulars necessary for the production of miasma, would be wanting, viz. considerable heat. Hence the necessity of deepening such receptacles as are useful, or which cannot be drained off, by taking up the mud in the cold season, when its decomposition will be unattended with injury; and these muddy depositions will also serve conveniently to raise the banks or borders, thus rendering that an ornament, which before was a deformity, as well as increasing in both ways the depth of the water, and thereby rendering it beyond the power of a common season to dry it up, and produce the deleterious effects so much to be dreaded. Another advantage of this deepening would be, that the quality of the water throughout the ensuing summer would be highly improved, for being freed from those organic germs, with which its deposit is so replete, it becomes, what it ought to be, a wholesome fluid for the drink of the higher animals of the farm. And where the pond is sufficiently capacious to contain a considerable supply of the deposit, it will be found one of the most valuable manures for dressing the adjacent land or the garden, which it is in the power of the farmer to procure, if these improvements be made in the receptacles; and if, in addition to these recommendations, the farmer takes care to sprinkle quick-lime in

the water, a very sensible amendment in these stagnated waters will follow.

Now what is said of the ill effects of ponds is equally applicable to stagnant ditches; to lands long covered with rains; to marshes; in short to all collections of water, which remain long to injure the herbage over which they may lie. And in all cases means must be adopted, which are directly calculated to prevent the injury; and when this is not to be averted, as far as regards the farm, then it is of the first importance to remove the sheep or cattle from the sphere of its influence, by taking them to higher and more healthy situations, and that too in time even before the miasma has been produced, and before the sheep or cattle have received chill or cold from its dampness. But still more important than even this, is to take care that they be not returned too soon to these grounds; here usually lies the error. Fine weather may return, the fields may be dried, and in consequence of the vegetation having been forced; it may appear more luxuriant, and the sheep may be returned just at the very juncture when the mischief, though least suspected, is at its greatest height. Let the noxious exhalations which are invariably induced by the herbage being subjected to the uncontrolled agency of mere chemical laws have time to expend themselves. Let the quick grass and the forced vegetation which has been elicited, have time to mature itself into natural, wholesome, and nutritious food. And remember also that the agencies of these baneful grounds are not bounded by the hedge that separates them from other lands, but that the sheep should be removed far enough to be out of the reach of their supposable influence.

As to those farms which are entirely situated in marshes, it amounts almost to a certainty, that the sheep will be diseased in a bad season. Where this is not the case it only resembles the miracles which sometimes occur, and for which we cannot account. A man may fall from a house, and not break a bone, but it is fifty to one against both his limbs and his life. I suspect, however, that if an accurate enquiry were instituted into the very few cases of flocks not being affected under such circumstances, it would appear that they have been well kept and attended to previously, and thus the predisposed weak habit of body had not been formed. But the exceptions in these cases are comparatively so few, that no sensible man will run so great a risk as is involved.

Under such unfavourable circumstances as we have been

noticing, if the farmer has no chance of removing the sheep, or putting them out on healthier farms to keep, he will act more wisely even in disposing of his flock, than in incurring such great hazard as he must do with them.

The diseases which occur in the sheep bred in marshy situations, are usually much more violent and aggravated than they are elsewhere; indeed the sheep do not generally outlive the acute state; their existence is terminated before the formation of the flukes, and before dropsical appearances are observable, their liver is mostly found in a state of suppuration or gangrene, which the farmers usually term rottenness; and even if they live to bring forth their lambs, they then die almost immediately, the chances are certainly greatly against recovery in these cases.

To the observations we have advanced with regard to the farm, we would add that the farmer will see the necessity of not confining his attention exclusively to the lands he occupies, he should acquaint himself with the peculiarities of those which are adjacent, thus mutual improvements may be effected, and a whole district rendered healthful, by a combination of judicious and well-directed efforts, while such exertions would be by no means expensive; and even if such a co-operation could not be attained, he would know the unhealthy grounds contiguous to his own, and thereby have a notice of the existence of even a remote evil which he could easily guard against. A knowledge of all these particulars, and of the relations they bear to disease if once gained, is gained for life. And we cannot too much regret that apathy and want of foresight, which is too prone to leave all these matters to the direction of unexplored causes, and the government of blind chance, which, sooner or later, is almost sure to rap the knuckles of the inattentive, for experience is a tremendously dear school to study these matters in.

Thirdly. On Temperature and Change of Weather. We all know how susceptible our own species is to atmospheric variations, even with all the expedients with which we are supplied by art, but how much would this susceptibility be augmented, if we were alternately exposed to the burning heats of noon day, and the chilly damps of night. Of course we do not mean to assert that the lower animals are equally liable with man to be influenced by these changes, but we ought to remember that they are living and highly organized beings; that their existence, as well as our own, depends on the due and healthy performance,

of a multitude of functions; and that there are innumerable tendencies to impede these actions, that they, as well as ourselves, are liable to a variety of diseases, and therefore are influenced by their causes; and where shall we look for a more prolific source of disease, than in the rapid transitions of weather from cold to heat, and from wet to dry in our climate. In truth, the error has never resulted from over care to the animals under us, but from its opposite, they are usually (especially the sheep) considered just one remove above the vegetables, and able to bear all changes and exposures with equal impunity, but it is fallacious to suppose so. And as we have found the domesticated animals so amply repay us for the care we have taken with them, it is more than probable that an extension of that care and attention will not be unproductive of its advantages.

It is indeed fortunate for us that in common seasons and changes of the weather, the animals suffer but little, and that they rarely require nursing; but then it is equally true, that there are limitations to their capacity of resisting influences of this kind, and that these bounds are sometimes overstepped, is rendered more or less apparent by the experience of every year; it ought too to be borne in mind, that when they are injured by these causes, there exists not the same facility of means of a remedial nature, as is possessed by our own species. A simple affection, such as cold or chill, may with the sheep go on from bad to worse, and indeed is usually allowed to do so, until it has become really formidable, and either conquers the poor animal, or is conquered itself by a great and unnecessary expenditure of his vital energies.

If it should be objected, "That the sheep is a very hardy animal; that even its lamb is able to stand the rigours of a winter season in its weak and infantile state, we observe in reply, first, That it has been satisfactorily shown in repeated instances, that the young of most animals can endure a vast deal more than the adult: even women have been found frozen to death, while the infant at the breast, exposed to the same severity of cold, has lived out the night, and ultimately grown up. And secondly, That it is not great heat, or great cold, we are now alluding to: but the change from the one to the other, the equable and continued severity of winter is infinitely less injurious to health, than the rapid changes of autumn; indeed we do not imagine it injurious at all, if the sheep are kept well, and in previous good health. But we leave it to the reader to

decide, whether the period of parturition is one of such exceeding good health, that the ewes should be subjected to the combined evils of low keep, and the pelting of the pitiless storm. However we wish attention to be more conspicuously directed to the alternate drenchings and scorchings of the summer and autumn.

How are these things to be amended? The sheep cannot be taken within doors? Granted. But is there nothing to be done between this and leaving them to all chances? There is. By shelter and by exercise. There are innumerable expedients which the farmer can adopt, and which the calculating farmer does adopt, for the accomplishment of both these ends. Now as to shelter. If this were a matter of indifference to the sheep, how comes it that on the prevalence of a cold easterly wind, or the continuance of rain, they leave the exposed parts of the field, and screen themselves by the lee side of the hedges, under walls, trees or mows; in short wherever they can flee to? Surely we should do well to notice such indications, and as far as our controul goes, to imitate them as well as we can. It would be superfluous to point out how this is to be effected; the means will abundantly suggest themselves to the farmer, and our only object is to call attention to it.

And with regard to exercise, we cannot but insist on its great advantage. In wet weather, or when cold has succeeded to great heat, the sheep may be driven moderately about the field or farm, for an hour or two at a time. The circulation will be materially assisted by such means, and the perspiration which under such circumstances, has a tendency to be impeded, will be restored and kept up. This point, simple and unimportant as it may appear, will certainly be followed by very salutary and invigorating effects.

Still it must be allowed, that as we have no controul over the change of the weather, and the variableness of atmospheric temperature, so we have not many means of preventing its effects. There are, however, some things that we can do, as noticed before, and some things we can avoid. We can certainly avoid shearing at an improper time, such as the prevalence of cold easterly wind, or rain, or if the sheep are previously sickly. And when they are sheared, if unfavourable weather quickly follows we can use more than ordinary exertion, in adopting those resources for shelter, and that plan of exercise which has been recommended. And even if we should, after all, be unable

to prevent illness, from our want of controul over the causes, we are then warned to be more on the alert in noticing the very first indications of disease, and of adopting restorative measures in time.

A great many things may be done, under all the circumstances we have been noticing, to make the condition of the sheep at all times tolerable, if not comfortable; but when a negligent inattentive shepherd, pays little or no regard to these particulars, but allows things to take their chance, when he neither studies the causes of evil, nor seeks a remedy, which is so generally within reach, it is no wonder that such distressing losses sometimes occur, and that such lamentable experience, so often repeated, should still have taught no useful lesson.

But supposing that, notwithstanding all possible care, the sheep should become diseased, what is then to be done? This brings us to our second question, viz. How the evil is to be remedied?

We presume, that because we have felt it necessary to lay considerable stress upon preventive measures, it will not therefore be concluded that we have but little faith in the power of medicine in these diseases—for we have very great confidence in these means, judiciously applied. Our wonder that these measures have been so rarely adopted is still greater than the surprise we have felt, at the apparent inattention to the preventive. And we are fully persuaded that most of the sheep who are left to their fate, without a single remedial effort, may be saved by the exhibition of proper medicine in proper time.

In order to the attainment of this desirable object, we must be permitted to impress upon the reader the absolute necessity of fully acquainting himself with the particulars laid down in the last chapter. First, As to the external sources or causes of disease, so that he may be induced to look suspiciously on such occurrences, as the probable forerunners and causes of the mischief; and if he has no opportunity of providing against them, that then by their very occurrence they may awaken in him an aptitude and promptness of observation, which at such seasons is so conspicuously called for, in order to apprehend the very first indications of any of the symptoms of disease belonging to the sheep: and not, as is generally the case, remain in ignorance of the matter, till the bad stages of the disease exhibit themselves so unequivocally, that it is evident the sheep must

have been long affected. And then, secondly, he should make himself familiar with the symptoms of disease in the sheep themselves, both in hepatitis and gall-sickness. These indications are particularly noticed in the description of the diseases, and as simply and intelligibly explained as I could well make them. I am aware that it requires some little tact to catch the various symptoms mentioned; but this capacity will be soon acquired. And when the existence of so much property depends on it, it will certainly repay the little labour of thought requisite. In these matters we cannot make the first early indications as plain as if a label were fastened on the head of the sheep, naming the presence of the evil, there must necessarily be some thought on the part of the observer himself, and perhaps there is no part of the multifarious concerns of the farmer which requires more attention than this kind of knowledge, and none which receives less.

There are also certain characteristic features in the habits and natural history of the sheep, with which every shepherd is or ought to be familiar. They have modes of exhibiting and expressing pain or illness, which are too intelligible to be misunderstood by those who are acquainted with their economy. The intuitive knowledge which may be from hence derived, may be brought into the aid of the more scientific species of observations we have recommended; and with a clear-headed observer will materially assist it, but it should never be allowed to supersede it.

If it had not been carrying the matter a little too far for the practical use of the agricultural reader, we should have especially noticed the pulse as a criterion of the state of health. To those farmers who may be curious enough to extend their enquiries farther than we have deemed absolutely necessary, we would mention that it may be conveniently felt in the carotid artery, about the point usually cut in slaughtering them. And also in the femoral artery, inside the thigh, about the middle and as high up as the fingers can be passed. If it be very quick and strong, or if it beats irregularly, it is usually indicative of disease; but under the influence of terror, which the animal usually manifests on being laid hold of, it may for a short time be quick from 100 to 140, where no disease exists; it soon, however, subsides. Some important data may be obtained from this examination, but we rather prefer having recourse to the more passable and easy modes, which it is next to impossible

for even a common observer to mistake, and which allows of no unsafe or uncertain conclusion.

We will suppose, then, that by comparing the results of his observations, the farmer concludes his sheep to be affected with inflammation of the liver. Then we recommend that the diseased animals be housed for a few days; that they be allowed a little good hay, and plenty of salt may be administered with it. It will be proper also to bleed them immediately to the extent of from 8 to 12 ounces; and this it will be rarely necessary to repeat, such a necessity will appear when there is a buffy coat, or very cupped appearance to the blood after it has coagulated; another bleeding at the end of two days may then be required. It is not, however, to be further repeated, because this blood may also be buffed or cupped; and indeed in most cases once will be found sufficient.

On the evening after the bleeding, give them five grains of calomel, and five grains of antimonial powder, made into a ball with a sufficient quantity of soap. On the following morning give another ball, composed of eight grains of aloes, forty grains of nitre, made up as before with soap, or the aloes may be given as a pill with the soap, and the nitre as a drench in warm water. continue a drench of the nitre alone a day or two longer; this will generally be all that is required.

Now the rationale of these measures will show that there is scarcely an indication in the disease that is not immediately met by them. The bleedings tend directly to the reduction of the inflammatory symptoms, and the abstraction of the blood cannot therefore be too soon effected. The calomel acts more certainly and effectually in restoring the function of the liver to its healthy state, than any other substance known. The antimony which accompanies it, by its febrifuge qualities, is also highly serviceable. It transfers the feverish exalted actions from the viscera, where they are hurtful, to the skin where they are safe. It thus removes the various consequences of obstructed perspiration, and by greatly accelerating that important discharge, reduces the internal inflammatory symptoms: this is the first dose.

With regard to the second, we observe, that the aloes, besides its property of working off the minerals in the first dose, is the very best drastic or purgative medicine extant, in diseases of a bilious character. It also greatly promotes the peristaltic action of the intestines: and the nitre which is given with it lessens

the vascular action, subdues inflammation, and acts as a powerful diuretic, by stimulating the kidneys and urinary organs to an increased secretion. It also prevents the formation of matter (pus) of concretions, or of sordes. Now by looking back at the order in which these matters are directed, and by bearing in mind, at the same time what has been previously advanced in the foregoing parts of this treatise, the reasons on which these prescriptions are founded, will be rendered apparent. And the farmer's knowledge of their action and powers will increase by experience, until he can safely venture to adopt alterations as to the mode and succession of these ingredients, which existing circumstances in the characters of the disease will appear to direct. And it is our particular aim that he should be acquainted with the "why and wherefore" of every precedence; that nothing should be left to the dictates of blind empiricism; but that, as far as possible, every measure should appear fairly to be the result of accurate observation and legitimate reasoning. Hence the necessity for our preceding chapters.

But valuable as these medicines are, it is not to be supposed that they can exert a magical influence: their efficacy will be precisely proportioned to the earliness of the time in which the first symptoms of disease are noticed. Thus although one course, as we have directed, may generally suffice, if the sheep be taken in time; yet if they are farther gone, it may be necessary to repeat it twice or thrice, or even more, allowing the sheep a day's run in the fields between, and taking care that the circumstances which first induced the disease be guarded against.

When we direct the sheep to be housed, it is not meant that they be kept in close confinement; the objects to be attained are preserving them from wet or inclement weather, while they are under the influence of medicine, and also keeping them from filling their stomachs with grass during the period. This may be done by turning them in the barton or skillings, or by folding; and moderate exercise is also to be permitted them, taking care, however, that they be not driven; for excessive action would totally defeat all our objects, and aggravate the inflammatory symptoms of the disease.

Again. Although the succession we have directed for the administering the medicines is perhaps the safest that can be adopted, and should certainly follow in the order stated for one course, yet there may be circumstances which would induce the farmer to vary the order subsequently. From the prognostics

of the case which he may have observed, he will, perhaps, sometimes come to the conclusion, that although all the desired objects may not have been attained, so that a further exhibition of medicines is still necessary, yet that some of the symptoms have been removed, and therefore those ingredients which at the first were requisite, are no longer so; then he may alter the further doses. Thus he may omit the calomel, and give the antimony alone, in the repetition of the first dose. Or he may reduce the quantity of aloes in the second. Or he may give the nitre alone, without either of the others. In all these particulars he must be guided by his own judgment and discretion, taking care, however, that such judgment be well founded on a pre-consideration of the circumstances of the case, as exhibited in our preceding pages. He will not, however, be wide of the mark, if he follows successively the exact order prescribed. And this will comprehend our mode of treatment for hepatitis. But supposing, that by comparing the results of his observations, as directed in the last chapter, the farmer should conclude that the sheep are infected by the gall sickness, then the mode of procedure will be somewhat different, and regulated by the appearance of the symptoms.

When listlessness or stupor prevails to a considerable degree, or if there is a fulness of the veins, or if the pulse be above 100, then it will be proper to bleed once to the extent of about eight ounces. We shall then have occasion to resort to the first dose in the last prescription, viz. five grains of calomel and five of antimony.

Next morning give five grains of antimony, and forty grains of nitre, of course including the usual allowance of salt, which is always to be presented. After this, a few hours' run in some good dry grass may be allowed. The next day, the medicine prepared as follows is to be administered. Take of oak bark (bruised) four ounces, water four pints, boil them gently for twenty minutes. Strain the decoction, and add one ounce of the diluted sulphuric acid, and give the sheep. Three table-spoonsful every morning and evening. If two drams of green copperas (sulphate of iron) be added to the quantity of decoction here ordered, it will greatly enhance its powers. Any other quantity may be made, by keeping the proportionate quantity of the different ingredients.

This last dose is to be continued till the symptoms of disease

have subsided. In very wet seasons it may be necessary to repeat it for a fortnight; in common seasons not so long.

Perhaps it may happen that the bark drench will act as too powerful a tonic, which may be noticed by the veins, showing a distention under the skin, and the turgescence of those in the eye, or within the lip, and to those persons who adopt this species of observation, by an increased fullness and rapidity of the pulse. In such cases it will be proper to omit the bark for a day or two; and nitre should be given in the interim, as before directed, or if necessary, a repetition of the calomel and aloes, about three grains of the former to five of the latter. After a day or two in the fields, the bark may be again resorted to, and will effect the cure.

When the sheep are turned out, it should be a little after the dew has been removed from the grass, and before the greatest heat of the day, and on the appearance of wet, let them be sheltered in the barn, the skilling, or the fold as before; the arrangement of which is left entirely to the farmer's discretion.

In taking the sheep in, it is necessary to observe, that we recommend them to be protected from the vicissitudes of the weather, and from eating to repletion while under medical treatment; and particularly to attend to a free ventilation. When many diseased sheep are confined in a close barn, it is exceedingly probable that the maladies will be aggravated, and also that there may be induced a contagious pestilential fever. Between the extremes on both sides the farmer is requested to steer.

In addition to our notices of the actions of the medicines, as given before, we observe generally that the ingredients we have now recommended may be divided into two classes, viz. stimulants and tonics. Among the stimulants are calomel, antimony, nitre, &c. these serve to correct and improve the secretions, inducing proper and healthy actions in the viscera; as it is the character of stimulants to be temporary in their effects. Hence the necessity of calling to our aid such tonics, as bark, iron, sulphuric acid, &c. to impart a permanent energy to the system; and they scarcely ever fail, when properly administered, to complete an effectual cure.

Although there is no necessity for tonics in the first stage of the complaint, hepatitis, it frequently occurs that when the inflammatory symptoms are removed, nature will effect the rest; yet the farmer may imagine that he is not sufficiently assured of

the distinctions of the two diseases, and will perhaps be at a loss whether to apply the bark drench or not. If he does give it, he will do no injury, even in the first complaint, provided he has previously adopted the means for the subjugation of the inflammatory symptoms, although it may be problematical whether he will effect any additional good by its exhibition. In this class of affections, however, (hepatitis) he is particularly warned not to continue the bark after great turgescence of the vessels is apparent, but to resort with more effect to the other means; bleeding again, calomel, and antimony once more, and the nitre repeated. This is only mentioned with a view of guarding against a mistake, which perhaps might, but which probably will not, occur.

In either of the diseases, after the sheep are again turned out, allow plenty of salt, with or without the soda, as they appear to relish it best.

And now having gone through our subject, by explaining the structure and nature of the organs liable to these diseases, by contrasting with the healthy state of these parts, the appearances presented to us on dissection, by tracing out the immediate and remote causes of these affections, both as it relates to extraneous occurrences, and to the system of the animal, and by pointing out the means of avoiding these evils, and of remedying them when they do take place, we leave the subject in the hands of the farmer, to carry into execution the proposed measures, assuring him of ultimate success, and this in a precise ratio to the degree of acquaintance he possesses himself with on the subject; for such a knowledge will lead him to proceed with as much judgment, in the management of his sheep, as he has been in the habit of employing in the culture of his ground, or the management of its various products.

The farmer may, perhaps, imagine that the multitude of particulars alluded to are too many for the attainment of a life occupied as his is. Or that the distinctions in the diseases are too nicely drawn for his discrimination. If we had thought such a knowledge unattainable by him, we certainly should not have been at the trouble of writing the foregoing pages. Neither should we, if we had imagined the end could have been as well attained without bringing him acquainted with the particulars they contain. These matters are all within his reach. There is scarcely a manipulation of any consequence in his highly useful profession, that has not cost him more for its attainment

than this will do; and in matters of this description it is impossible for him to have a presiding genius on the spot at all occasions. He must be his own director; and when the modes of investigation and comprehension are pointed out, with such a monitor he will have no Herculean labour to perform. To publish a treatise for all the diseases incident to the sheep, would indeed be beneath contempt, and would terminate, as all other empirical efforts have done, viz. in disappointment. Besides, it would be a libel on the understandings of a body of men, who only require a guide to direct them in the pursuit of that knowledge which the circumstances of the case render indispensable; and who want no further stimulus to excite their ardour than has unfortunately been given by the loss of so much property.

In our medical prescriptions, economy has not been lost sight of. When the articles are somewhat expensive, we have taken care to be satisfied they are not of an equivocal character. And in order to furnish the farmer with the probable amount of expense, an estimate of the cost of the various medicines is appended; the result of which will show, that a stock sufficient for a considerable flock is comparatively trifling. We of course suppose him to furnish himself with some grain scales, and purchase the articles in quantity:

	s.	d.	
2 ounces of calomel will cost	1	6	making 192 common doses.
4 oz. of antimonial powder,	2	6	.. 384 ditto
4 oz. of aloes	2	0	.. 192 ditto
1 lb. nitre	0	10	.. 144 ditto
$\frac{1}{2}$ lb. diluted sulphuric acid	0	4	
$\frac{1}{2}$ lb. sulphate of iron ..	0	6	

making together 7s. 8d., which will furnish him with a stock, greater than he may have occasion to use for a long time.

Of course the farmer will see the necessity of keeping each article dry, in a separate bottle, and well stopped, and legibly labelled on the outside, with the precaution of having the word "Poison" written under each to prevent accident. All the bottles may be lodged in a snug box, fitted up as a medicine chest, which should be always kept locked, and safely deposited in some dry situation in the house. His grain scales, a Dutch tile, and a palette knife to mix his medicines, which will complete his stock.

If there should appear to be any occasion for more rigorous

doses than we have ordered, (for we have supposed the case to be taken in time) we add the following directions as the maximum dose of each, which is never to be exceeded in the sheep; of calomel, fifteen grains alone, and followed next day by a purge, antimony ten grains alone; bark decoction, the same quantity as ordered, but having the bark, acid, or copperas doubled in making. The dose may, when given, be diluted in as much more water as is convenient to make a drench; then of aloes ten grains alone, nitre a quarter of an ounce. It must be a desperate case that requires fifteen grains of calomel, and it is never to be resorted to but as a forlorn hope; even then three successive doses of five grains each will be infinitely preferable. We here only mentioned fifteen grains as a quantity, beyond which it is absolutely injurious, if not fatal to go: the other matters may however be increased with safety, and often with advantage, any proportion between the proper dose, and the extreme quantity specified above.

One word of caution in conclusion. Our object in the present treatise has been to enable the farmer to understand the nature of the diseases in sheep, and to become their doctor himself. Let it not, however, be for a moment supposed that he is warranted in applying any of these medicines to his own species. We hope that there will be no occasion for such caution; but we cannot forget that it is a feature in the human mind to be inquisitive and experimentalizing. A friend may sometimes recommend a calomel pill, when there is any little ailment; and the farmer, determining to profit by the wiseacre's advice, and having calomel in his possession, may be unwilling to pay for a dose which would be properly apportioned to his state by a practitioner, or even a druggist. If he ventures, it will be on his own responsibility, and at his own peril. No authority whatsoever can be deduced from these pages to sanction him. No attempt is made to explain the complex nature of man, and no perfect analogy can be established betwixt the intricate and difficult diseases to which he is subject, and those more simple affections of the lower animals. I adjure the reader, therefore, to avoid speculative and empirical notions of his own constitution, and to confine his attention to that of the animals placed under his care: here he has a wide, interesting, and a proper field of research, and he will derive both pleasure and profit in proportion to the accuracy of his acquaintance with it.

